FEBRUARY 1981

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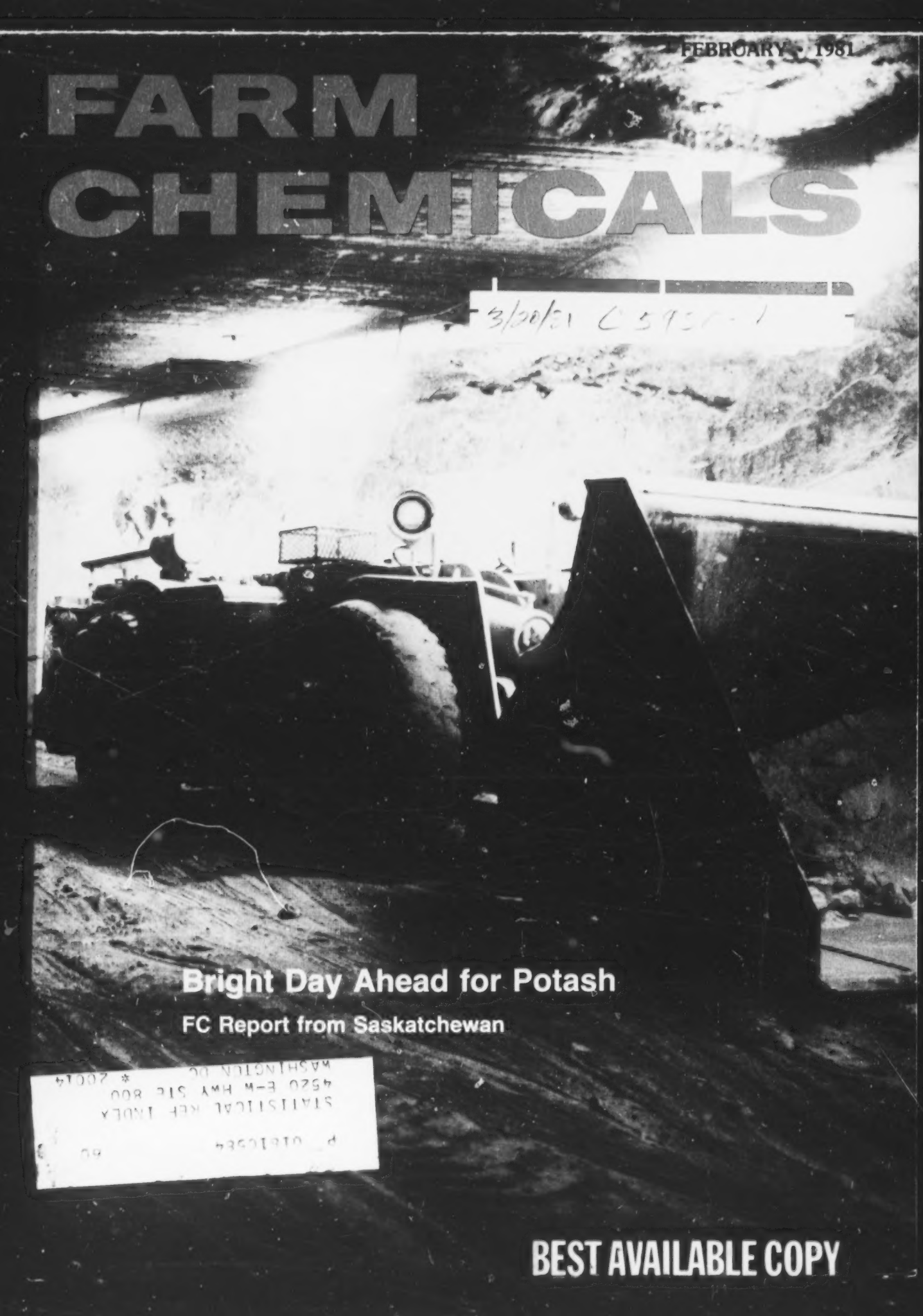

Bright Day Ahead for Potash

FC Report from Saskatchewan

STATISTICAL REF INDEX
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The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS serves primarily manufacturers, formulators, mixers, dealers, and commercial applicators of fertilizers and pesticides, reaching those persons responsible for management, marketing, and production. Subscription rates are: in the U.S., its possessions, $16.00; in other countries, $20.00. Established in 1894 as THE AMERICAN FERTILIZER and incorporating CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER.

Farm Chemicals (USPS 995-020)

Published monthly by
Meister Publishing Co.
37841 Euclid Avenue
Willoughby, Ohio 44094
216-942-2000

Controlled circulation postage paid at New Richmond, Wis.

Regional editions of this issue contain additional pages numbered 60 A1–A2, 60 B1–B2, 60 C1–C2 and 68 A1–A2. They appear following Pages 60 and 68.

Postmaster: Please send change of address "Form 3579" to FARM CHEMICALS, Willoughby, Ohio 44094.

FARM CHEMICALS

Volume 144 No. 2 February 1981

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THE COVER STORY

There are bright days ahead for Saskatchewan potash. Supply/demand is tightening, leading to expansions and new mines. For the full story, see FC's Report from Saskatchewan beginning on page 13. *(Photo courtesy Potash Corporation of Saskatchewan.)*

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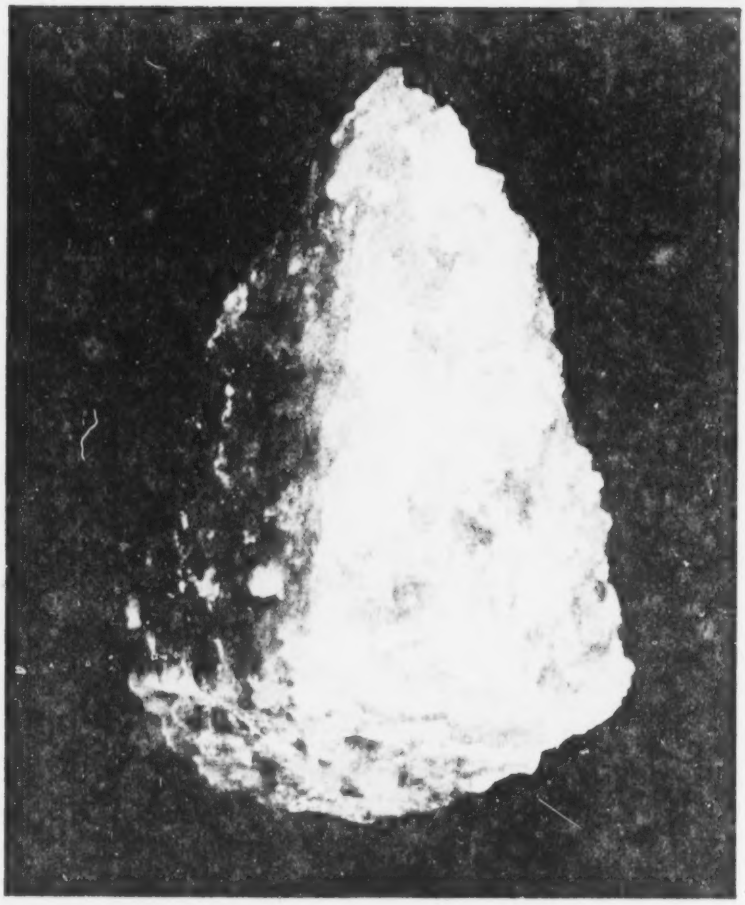


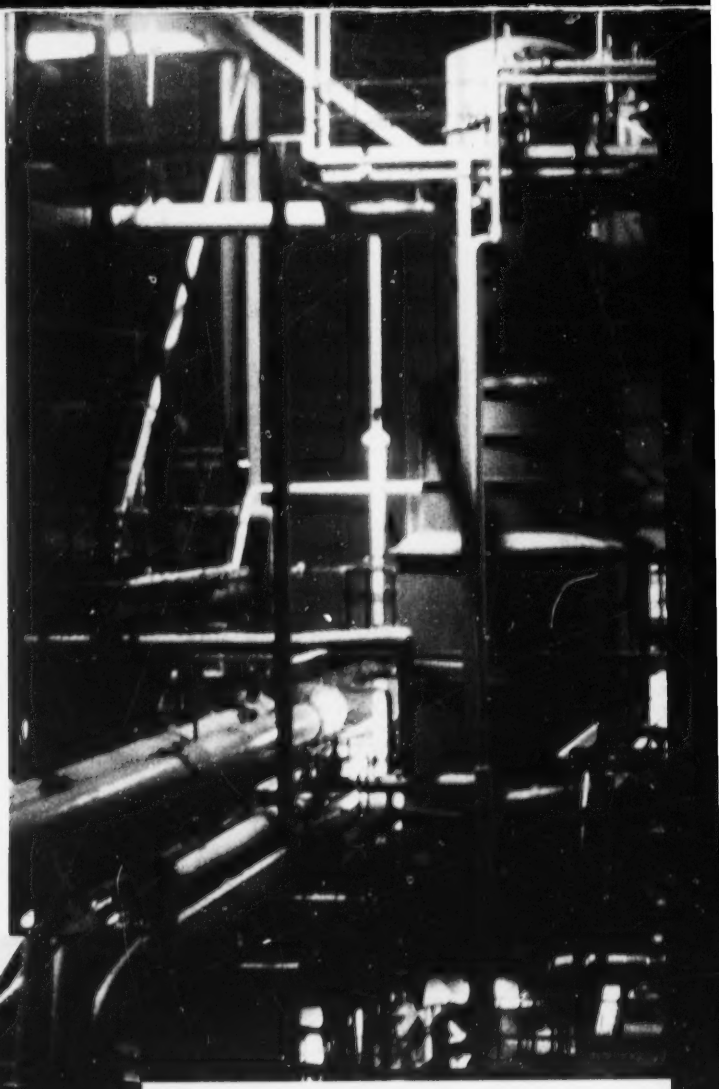
BRIGHT DAYS AHEAD FOR POTASH

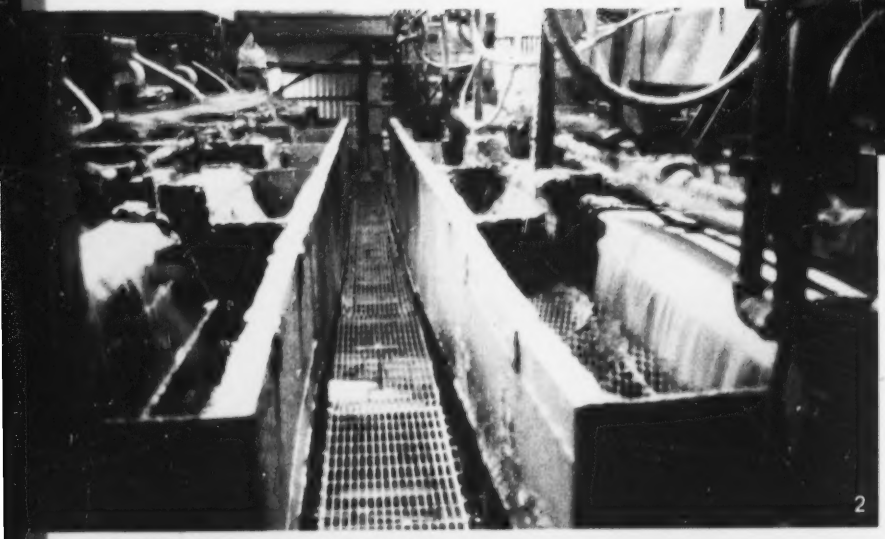
FC Report from Saskatchewan

SINCE the very beginning, the Saskatchewan potash industry has been ... well, turbulent. The first company to try mining the richest known potash reserve in the world, Western Potash Corp., ran into technical and financial problems and abandoned the project. The second company, Potash Company of America, successfully opened its mine and refinery in November 1958 only to have seepage of water into the shaft force the closing of the mine just one year after the $20 million complex began production. The mine remained closed for 6 years until the problem was finally solved. The third company, International Minerals & Chemical, made a major technological breakthrough by buttoning up the Blairmore formation, a mass of fluid quicksand under explosive pressure "guarding" the ore deposit. (See page 22).

IMC opened the first of its two mines at Esterhazy in 1962. During the next three years, construction of 7 other mines began and by the end of the '60s, the Saskatchewan industry was producing over 8 million tons K_2O a year.

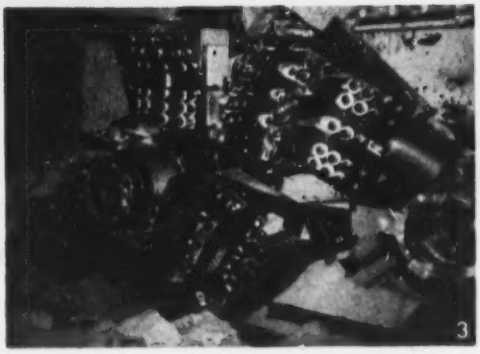
The growth was rapid, far more rapid than growth in demand, and prices plummeted. Charging that the reserves of a valuable mineral were being squandered at the expense of the people of Saskatchewan, the provincial government instituted a prorationing program, curtailing production to about 40% of rated capacity and establishing a minimum selling price. As demand increased, the various mines were allowed to increase production and by the mid-1970s were



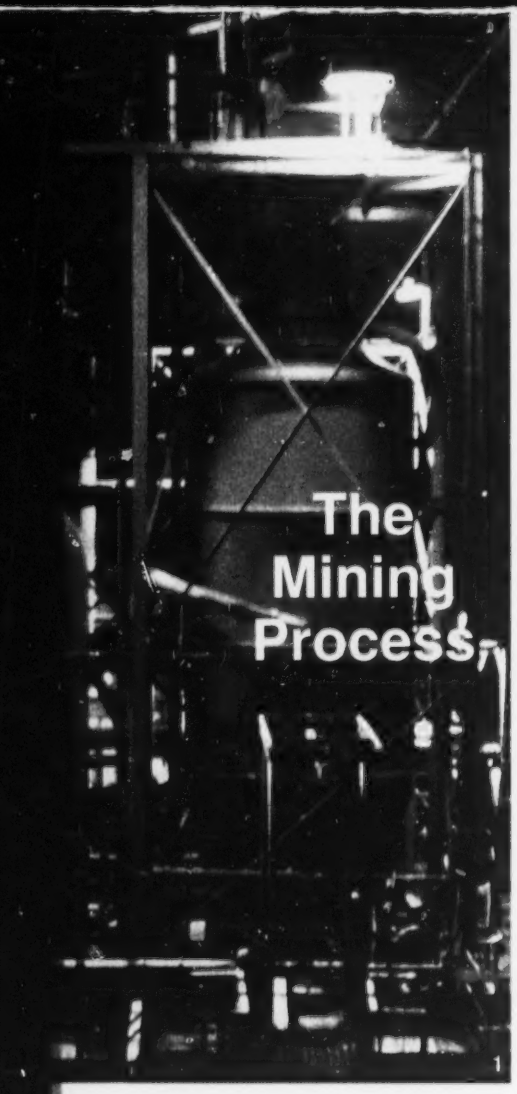


IN Saskatchewan, potash occurs in the Prairie Evaporite Formation in three beds which vary in depth from approximately 3000 to 5000 feet and more. Potash ore, or sylvinite as it is called, is a mixture of about 50% common salt (halite), 45% potassium chloride (sylvite), and 5% clay.

Of the 10 potash mines in Saskatchewan, 9 use conventional room-and-pillar mining techniques; Kalium Chemical at Belle Plaine extracts ore using a solution mining technique. In the conventional mining, the ore is extracted from the ore bed using high speed continuous mining machines that can cut from 8 to 12 tons of ore a minute. The ore is then broken into pieces, loaded on to a conveyor belt for transport to the shaft, then loaded



1. The refinery at Cory Division, PCS Mining.
2. Flotation cells in the refinery.
3. The continuous mining machine.
4. Distinctive pattern made by cutting edge of mining machine.



into a skip for hoisting to the surface.

At the mill, the ore is first crushed, then introduced into a brine solution, and ground. Minute clay particles are removed by high agitation. After desliming, reagents are added to the brine to separate the potash from the salt by a flotation process. The potash particles are skimmed off the top of the flotation tank; the salt is drawn off from the bottom and then mixed with clay from the desliming step for disposal. In separate centrifuges, brine is removed from the recovered salt and potash and returned to the process. The salt is moved to the tailing pond, the potash conveyed to dryers. From the dryer the potash is screened into the four principal grades—granular, coarse, standard, and soluble.

Dust recovered from the drying step is dissolved in hot brine, then cooled under vacuum which causes the potash to precipitate out in white, highly pure crystals which are marketed in two grades: Refined potash is double crystallized and 99.9% pure KCl; soluble potash is 62.5% K_2O minimum. FC

operating at about 70% of rated capacity.

There were some grudging acknowledgements that the prorationing program had helped to stabilize the market; and if that had been the *only* government action taken during this period, Premier Ross Thatcher might well have gone down in industry annuals as a hero. But there were others.

In 1972 the government instituted a prorationing fee of $1 per K_2O ton, a year later doubling it to $2. That was onerous enough in the eyes of the 10 private producers until the new Premier, Allan Blakeney, announced his "Saskatchewan Potash Policy" in October 1974.

The policy included three programs, one of which was deferred: A reserve tax on the value of the potash ore reserves, mines, and refining facilities; direct participation by the provincial government in new projects and expansion of existing facilities; and payment in kind (*i.e.*, in potash) at a 10% discount of all taxes levied on the industry. Reportedly, the government planned to use this potash as the basis for forming a government marketing agency to launch the province into potash marketing. This segment of the program was deferred.

It was the reserve tax that exploded into a virtual war between the provincial government and industry. Industry figures showed that between the reserve tax and provincial mining charges and income tax, and the federal income tax, the industry was paying out almost 90% of its pre-tax profit. There were flat refusals to pay and lawsuits filed. (It was not until last year that the reserve tax issue was settled.)

The government counterattacked, claiming that the industry was not paying its fair share of taxes and ought, therefore, to be subject to additional imposts. Their premise? The province's potash reserves belong to the people of Saskatchewan. Premier Blakeney and his New Democratic Party were determined to see that "the maximum benefits of this rich resource go to the people."

To carry out the program of government participation proposed in the Saskatchewan Potash Policy, a crown corporation was formed—the Potash Corporation of Saskatchewan—in February 1975. Twenty months later PCS purchased Duval Corp.'s mine at Cory for $128.5 million. It was the first of five acquisitions made over the next two years.

PCS entered the market place with two strikes against it. Few people cottoned to the idea of government intervention in private industry. From major producers to the smallest of bulk blenders, the word was often, "We're not buying potash from those guys."

How PCS overcame that opposition to be considered to operate in a very responsible, statesmanlike manner is a story worth telling.

"Platform Decisions"

As a crown corporation, the PCS board of directors is made up of people in business, government, industry, labor, and agriculture. Chairman of the board is a minister-in-charge, currently the Honorable Roy Romanow, who reports to the provincial legislature. To head the fledging new corporation headquartered in Saskatoon, the board selected David Dombowsky, deputy minister of the Saskatchewan Department of Finance, and formed two wholly-owned operating subsidiaries—Potash Corporation of Saskatchewan Mining Limited and Potash Corporation of Saskatchewan Sales Limited.

Dombowsky, who had witnessed the confrontations between government and industry over the reserve tax, was acutely aware of the animosity toward PCS. Looking back, he points to what he terms "platform decisions that in retrospect have turned out to be very fortunate."

One such platform decision was the establishment of a sales office for North America at Atlanta, GA and the appointment of Jim Hunter (now retired) as manager of North American sales. Hunter was well known in the industry, had been vice-president of Duval Sales Corp., vice-president of Duval Corp. of Canada, and during this time was also vice-president of export sales and a director of Canpotex, the Canadian Potash Export Corp. Hunter assembled a team of veterans, several of whom had been with Duval, and who were equally well regarded by their associates in private industry.

Rolf H. Holzkaemper, managing director of Potash Corporation of Saskatchewan Sales Limited who joined

LISTEN to mining engineers discuss expansion of a potash mine and you'll hear some new jargon, shorthand phrases like Phase I and Phase II. What are they talking about?

Phase I means to bring an existing mine to its mill limit, and is usually essentially a debottlenecking.

Phase II brings the mine to its shaft limit, and generally requires construction of a new mill.

Phase III involves the addition of at least one new shaft.

Phase IV? That's a whole new mine!

David Dombowsky, president of Potash Corporation of Saskatchewan, is guiding the 10-year, $2½ billion expansion program.

Rolf H. Holzkaemper, managing director of PCS Sales, predicts "there'll be more discussion of allocation than trying to make a sale within a couple of years."

the company in 1978 from Potash Company of Canada (Potacan), was a competitor during those early days of PCS so that his evaluation could be considered as unbiased.

"PCS took a right first step in hiring Hunter, Tom Tucker, and the rest of the men who formed the nucleus of the marketing team. Much of the credit for the company's acceptance is due to their personal acceptability in the field."

Another platform decision, Dombowsky believes, was to become an active part of the industry. "We took the decision that we wish to cooperate with other producers in the area of masket development. Very early on we joined the Potash and Phosphate Institute and are now the single largest contributor to PPI, which is American-based. We became members of The Fertilizer Institute and the International Potash Institute. We have been major contributors, not only in terms of money but also in terms of leadership and ideas, in all three organizations."

A third was the decision to go into the private money market to finance acquisitions, and to pay taxes in the same manner as a private company. A fourth, and perhaps in retrospect one of the most important, was the decision "to launch expansions at our mines when there was a surplus of product on the market."

Dombowsky points out that PCS bought a number of operations "when there was a surplus of product, when the prices were depressed and we had a breakeven position in rate of return. A lot of forces around us were threatening. But the board stuck with us, and we think it has worked out well."

For the year ended June 30, 1977, PCS reported sales of $22 million; for '78, $107 million; for '79, $210 million; for 1980, $312 million. The outlook for '81 (when PCS goes on a calendar year for fiscal reporting) is for "a substantial increase."

Production has grown during this same period from 820,000 tons KCl to 4.75 million in '79–80. And PCS recently unveiled a 10-year plan to increase production to 12½ million product tons by 1990.

Today PCS accounts for about 40% of total Saskatchewan production. There has been a constant upgrading of production facilities since the corporation acquired its first mine in 1976. There was a period during prorationing and the reserve tax when very little money was invested in any of the mines, in some instances only bare necessity maintenance work was completed. Even when demand boomed in '77, most of the mines were incapable of operating at rated capacity. Debottlenecking was the first order of business.

That challenge fell to Donald G. Matheson and Brian C. Kaukinen. Matheson, now vice-president—technical for PCS, joined the company in 1975 from Comstock International Limited where he was general manager of the mining division in the special projects group. Kaukinen joined PCS Mining that same year as vice-president of production, leaving Hudson Bay Mining and Smelting. He is now operating director of PCS Mining.

"In most instances the management of the various mines stayed when PCS acquired the operations. All the mines used basically the same techniques but there were individual differences—not only in ore body but in organization and psychology of operating," Kaukinen explains. "We have steadily improved all the mines, and to some extent have taken ideas for better organization and operation from one mine and introduced them to the others. There is still a great deal of autonomy of operation at each of our mining divisions."

There are several reasons for having each division operate as a profit and loss center, perhaps the most paramount being "to prevent any decay of competitive spirit between the plants that existed before PCS acquired them." As Don Matheson explains, "We haven't introduced change for the sake of change. We have tried to stress pragmatic values."

The first mine to be acquired was the Duval operation at Cory. "Because this is the operation we know best, it has had more influence on the rest of our divisions," Kaukinen believes. "But each of our five mines is still unique in many aspects."

When PCS took over at Cory, rated capacity was 1.2 million tons KCl/year. Debottlenecking has upped capacity by 300,000 tons. "We have added a mining unit, expanded underground storage, and increased the speed of the hoist," Kaukinen explains. "The cost was just about $7½ million."

Rocanville was the second acquisition, purchased from Hudson Bay Mining & Smelting. Capacity was upped from 1.2 to 1.4 million tons KCl by adding more compacting and screening area, increasing storage on surface, and debottlenecking in the mill. Cost of this Phase I improvement was $11½ million. Product split was also altered, with more coarse and granular being produced.

Canadian Potash Industry Expansions

SASKATCHEWAN

Central Canada Potash

Expansion: Increasing capacity to 1.14 million tons/year KCl

In Production:

Cost: $72 million

Cominco

Expansion: Upgrading shaft and mill to increase capacity to 1.1 million tonnes/year

In Production: 1982

Cost: $30 million

Kalium

Expansion: Refinery improvements to increase capacity to 1.8 million tonnes/year

In Production:

Cost: $23 million

Potash Company of America (PCA)

Expansion: Improve and upgrade surface facilities to increase capacity to 1 million tons/year.

In Production: 1982

Cost: $23 million

Potash Corporation of Saskatchewan (PCS)

Bredenbury

New mine: Shaft construction to begin in 1982. Capacity projected at 3.6 million tons/year of product.

In Production: Late 1986

Cost: $600 million

Lanigan

Expansion: Adding 10 mining machines and related equipment to increase production to 3.2 million tons

In Production: 1983

Cost: $430 million

Rocanville

Expansion: Adding mining equipment and milling capacity to increase production to 2.0 million tons/year

In Production: Late 1981

Cost: $73 million

NEW BRUNSWICK

Denison-Potacan Potash Co.

New mine: Shaft construction underway. Initial production estimated at 1.3–1.5 million tons/year.

In Production: Spring 1983

Cost:

Potash Company of America (PCA)

New mine: Surface facilities now under construction. Rated capacity will be 1 million tons/year

In Production: Late 1982, early 1983

Cost:

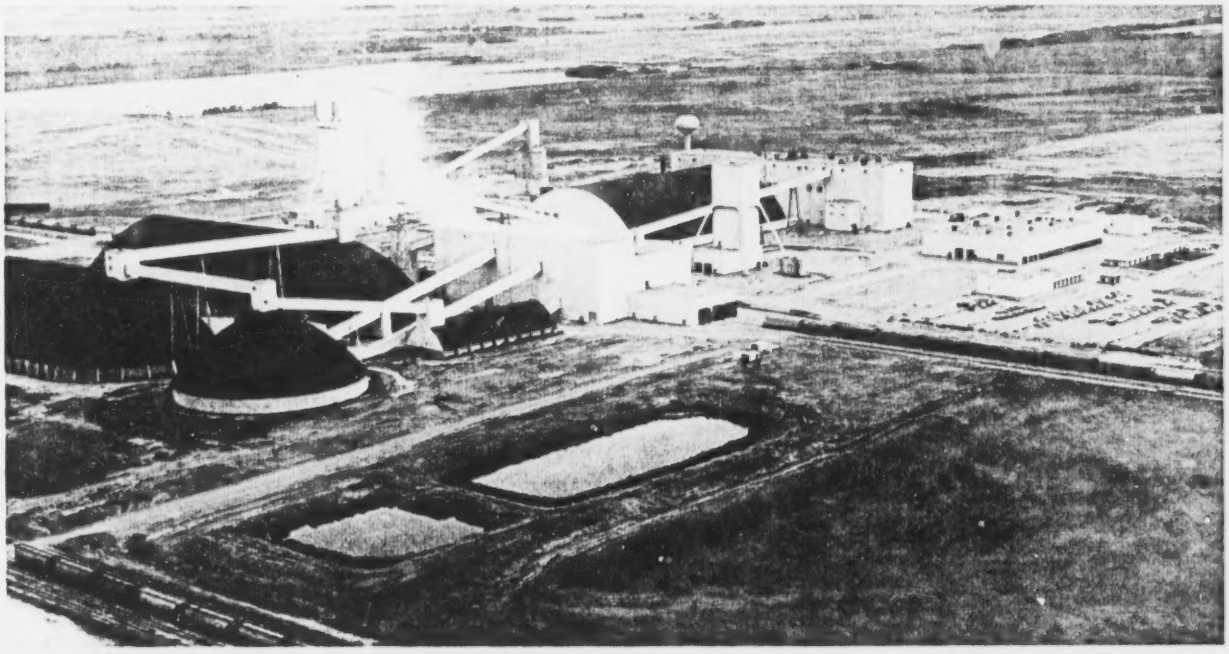
British Petroleum of Canada

Has been granted exploration rights

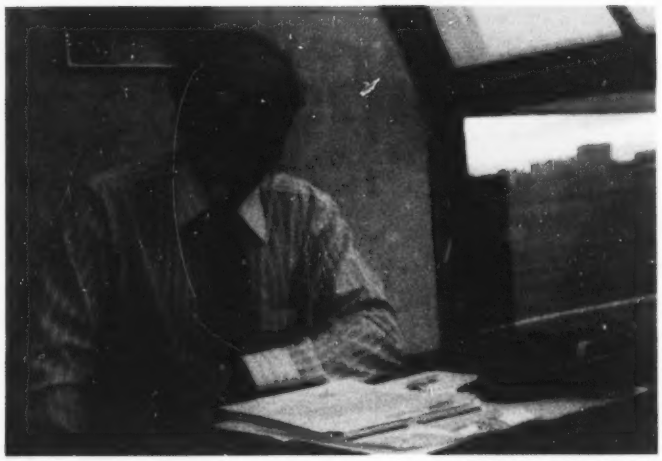
MANITOBA

International Minerals & Chemical (IMC)

$2 million exploration program now underway. No production anticipated within decade.



Don Matheson is vice-president—technical for PCS.



Jim Sadler is vice-president of engineering for PCS.

Operating director for PCS Mining is Brian Kaukinen.

Vice-president of corporate development for PCS is Doug Karvonen.

Late this year Phase II will be completed at Rocanville. Mining equipment has been added, and milling capacity increased to bring rated capacity to 2.0 million tons/year. "We are essentially increasing the entire concentrator complex by 50%," explains Kaukinen. "Enough compaction capacity will be added so that all of the incremental production can be coarse or granular grades. About $10 million of the $72 million budgeted for the expansion is being spent underground, most of it for two new four-rotor mining machines. The conveyor system is being expanded and the skip capacity boosted."

In late 1977 PCS acquired Lanigan from Alwinsal Potash. Capacity was rated at 1 million tons "but it had never been reached. We shut down Lanigan for more than five months to complete refurbishing. Since then a new changehouse has been built, underground mining machines have been overhauled, and we've added a second shaft," Matheson points out. "We're now going into Phase II which includes a fleet of 10 new four-rotor continuous borer mining machines to develop two new mining blocks underground. We plan to introduce a new mining configuration when the machines come on stream. A new mill will be built. When Phase II is completed, Lanigan Division will have a rated capacity of 3.2 million tons KCl per year. That will make it the largest single-production-shaft potash operation in the world."

Last of the mines to be acquired was Allan, in which PCS holds 60% ownership, Texasgulf 40%. Last year PCS Mining became operator of the mine, with Texasgulf retaining its interest in the assets of the mine. A Phase I expansion is now underway which will add 240,000 product tons to current production. Additional equipment is being installed in the mill, some modifications being made in the underground conveyor system, and the hoist speed increased.

PCS' investments also include $1.3 million to construct a potassium sulfate pilot plant in Saskatoon to "prove the production process which, if successful, could lead to a plant that in 2 to 3 years will be capable of producing 200,000 product tons of potassium sulfate."

There is a strong emphasis on research and development. David Dombowsky points with pride to the decision to return a minimum of 1½% of total gross sales to R&D. PCS is building a new research facility at SEDCO Center in Saskatoon. The R&D program is aimed at developing new products, lowering production costs, and improving existing product quality, as well as agronomic research. "We take our role in world agronomy very seriously," Dombowsky emphasizes. "In fact, I feel very strongly that not enough is being done, and it is one of my own priorities as well as a priority of the corporation."

"We will have a full agronomy department sometime this summer to support our sales efforts in the field," adds Holzkaemper. In addition, PCS is supporting research at the university level.

But it is in the area of production and recovery that PCS will be concentrating much of its R&D efforts. Heading up the program are Matheson, Kaukinen, and James F. Sadler, who joined PCS last year as vice-president of engineering. A graduate of the Royal School of Mines in London, England, Sadler has more than 30 years of diversified Canadian mining experience, including 14 years in potash manage-

Gene Stockert is manager of national accounts (co-ops) for PCS Sales.

Sid Blair is executive assistant to Rolf Holzkaemper, managing director of PCS Sales.

Steve Dechka is special assistant to the managing director of PCS Sales.

Doug Logsdail is manager of national accounts for PCS Sales.

Manager of field sales for PCS Sales is Tom Tucker, headquartered in Atlanta, GA.

ment positions. His last position was at Allan Potash Mines where he was president and general manager. Sadler will also be responsible for the $2.5 billion expansion program outlined in PCS's 10-year plan.

"We'll be investigating new drying processes, alternative methods of salt separation, improved mining techniques to increase extraction methods, ways of increasing the recovery percentage of potash from ore, and techniques and methods for reducing environmental impact," explains Matheson.

The Potash Industry's "Albatross"

The phosphate rock industry has gypsum as its albatross, the potash industry salt. There is a ratio of roughly 4 to 1 on ore raised to the surface to potash recovered, and that's with recovery of 90% of the potash contained. The rest is common salt and clay. Giant salt piles can be found adjacent to every mining location. To date, all storage has been above ground although there has been some speculation that storage underground might be proposed in the future as backfill. This would solve an environmental problem, but getting the salt back underground is a problem because it can't be slurried. The salt would have to be bone dry to be used even as blown-in fill. Another possibility might be to move the milling underground, which would also save the cost of hoisting the salt and clay to the surface. The stumbling block here is that concentration of potash from the ore is a very wet process, and introducing water into the mine could be disastrous. The potash is buried in salt, and salt is hygroscopic. Excessive moisture would cause both the salt and the potash to dissolve.

Jim Sadler calls the technique of tailings impoundment "a difficult one." Projects are being planned to see what the weight of salt piles is doing, if there is any sinking, so fail safe dyking systems can be developed. "This is not an intense environmental issue but it could be in the future," acknowledges Matheson. "If we have to go underground to store the salt, it would kill the industry from a cost standpoint."

Sadler points out that PCS is also looking at energy consumption at the mills, and hopes to replace natural gas with local Saskatchewan coal. "It's just a question of how and when we're going to use it," emphasizes Matheson. "When the industry started in the '60s, natural gas cost 25 cents per mcf; now it is approaching $2."

Reducing mining and refining costs are being given top priority. Sadler admits that there are few new techniques that have been developed. With the exception of continuous mining

For Details Circle No. 109 on Postcard——→

machines adapted by IMC from the coal industry, the mines in Saskatchewan are based on methods long used at Carlsbad, NM. "There have been relatively few significant breakthroughs in potash mining technology," he acknowledges. "It's no big deal to duplicate what you've got. We have to innovate."

One innovation is planned for Lanigan. Potash miners employ a technique called room and pillar. This involves cutting a series of rooms which are separated by pillars. A room 67 feet wide and 4000 feet long is cut by the four-rotor continuous mining machine. A pillar 50 to 60 feet wide is left and another room 67 feet wide and 4000 feet long is cut. Then a second pillar 180 feet wide is left. The same series is then repeated. Lanigan will switch to a four-pass system. A room 8 feet high and 45 feet wide will be taken out in two passes, and then the room will be deepened another 7 feet in two additional passes. Sadler explains, "We've been leaving a lot of ore in the floor up until now. Besides giving us more ore, the new system of mining will prevent bad floor heaves associated with the ore that we leave behind."

Mine layout and experiments in room and pillar designs are continuously being studied. Each mine is routinely shut down one day a week for maintenance of equipment and to plan future moves. A laser beam is used to maintain direction of the mining machine.

First Grassroots Mine

Last fall fieldwork began on PCS's first grassroots project—a mine and refinery to be built near Bredenbury. "We have to complete an environmental impact study before final approval for plant construction is granted by the provincial Department of the Environment," explains Matheson. The EIS is expected to be completed within a year.

"Work will concentrate on studies of the ground and surface water conditions, and environmental impact on the region's plant and animal life. We will also have to drill exploration holes to more accurately assess the area's ore grade, the outside limits of the ore body, and the most suitable location for shaft construction," adds Douglas A. Karvonen, vice-president of corporate development.

Pending approval by the Department of Environment, shaft construction is scheduled to begin in 1982 and will take about 4 years to complete.

The plant is expected to come on stream by 1986 with an annual capacity of 3.6 million short tons KCl. When fully operational, the facility will employ more than 400 people. Cost of the project will exceed $600 million.

Completion of Bredenbury and expansion currently underway and planned will push PCS's production to 12½ million product tons by the end of the decade.

While PCS Mining was debottlenecking the minesites, PCS Sales was beginning to turn animosity into respect, and gaining a considerable acceptance in the market place at the same time. One PCS salesman who was among the first in the field recalls it was an uphill battle in the beginning. "Our competitors weren't too happy about what was happening in Saskatchewan and their criticism was expressed throughout the U.S. market, even unwarranted personal criticism. It took fortitude and a determined sales approach but we slowly gained a significant foothold in the market place.

"Another thing that helped was our shipping performance. Because we had more than one source of supply, we could deliver the product."

Knowledgeable salesmen, service, and dependable delivery have been the foundation on which PCS Sales has built an enviable sales record. Today there are 12 district managers calling on some 1200 individual, independent field accounts in the U.S. Head of field sales is Tom Tucker, a Duval veteran who joined PCS in 1977. Gene Stockert is manager of co-op accounts, while Doug Logsdail is manager of national accounts. Tucker heads the sales office in Atlanta, GA;

Conquering

IT happened almost two decades ago but without the conquering of the Blairmore the rich reserves of potash that bless Saskatchewan might never have been fully developed.

Potash was first discovered in southeast Saskatchewan in 1943 when geologists looking for oil discovered evidence of the world's largest known body of high grade potash. The ore body stretches 450 miles across Saskatchewan into Manitoba, and in some areas is 50 miles wide, with the ore beds 3000 to 5000 feet below the earth.

Guarding the ore was a formation that almost defied mining engineers. Called the Blairmore, it is a mass of fluid quicksand under explosive pressures over 200 feet thick which begins at the 1200-foot level within the some 2700 feet of shale and limestone that covers the potash ore body. Pressures in the Blairmore run as high as 475 psi. "To puncture the Blairmore is to release the fury of forces imprisoned for 200 million years," observed International Minerals & Chemical Corp., the first company to successfully conquer the Blairmore.

IMC had been exploring the potential of the Saskatchewan reserves and after much deliberation decided to sink a shaft near Esterhazy. Work began in 1957. A year later the concrete-lined shaft had been pushed to a depth of 1200 feet, just above the Blairmore. To reach the potash the quicksand had to be tunneled through, the high pressure waters contained. IMC graphically described the problem in a special potash report as follows:

"There are two primary ways to control underground water. Pipes can be sunk into the water-bearing formation and refrigerants circulated through them to freeze it. Then digging can proceed through the frozen formation. Shaft walls are lined as you go, before thawing is permitted.

"Grouting is the other method. Deep holes are drilled into the bottom of the shaft. When these holes hit water, a mixture of water and cement is pumped down under heavy pressure. The pressure forces the grout into water-bearing porous rock and cracks between rock. The grout hardens and seals off the water.

"At first grouting was employed but the Blairmore counterattacked. Twice it struck back, shooting water into the shaft and endangering the whole project. Once the flood surged to within 120 feet of the top of the shaft."

IMC decided to try a technique never before used in North America but tried and proven in Europe. First step was to freeze the Blairmore. "Sixty-two freeze holes were drilled into the stratum," IMC noted. "Pipes in the freeze

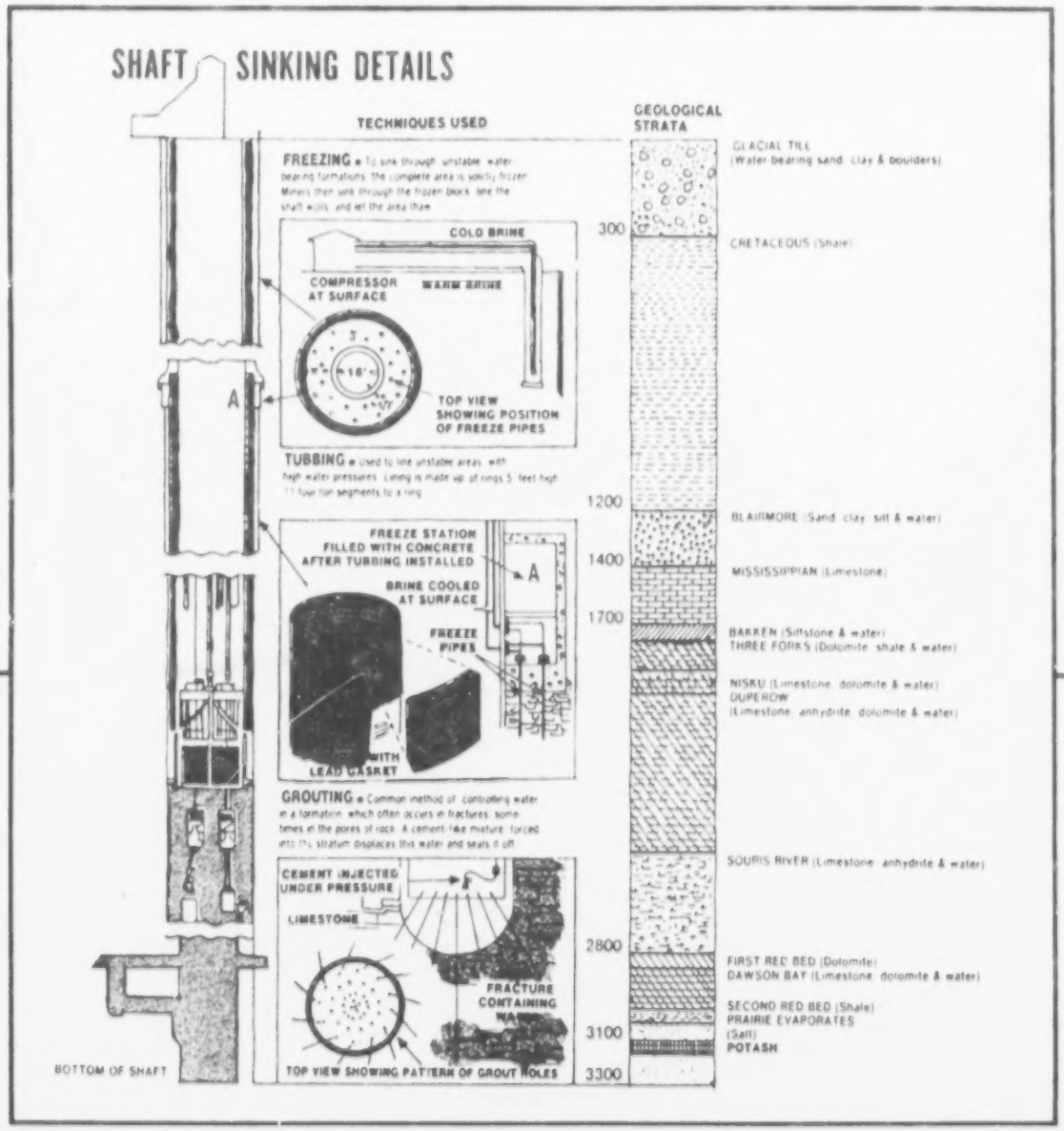
the Blairmore

holes circulated a brine solution pumped in at a frigid 30° below zero. The Blairmore began to ice up, expanded, and froze. Freeze pipes burst. They were replaced. But now the Blairmore contained pockets of brine from the burst pipes, brine that had to be frozen along with the Blairmore water. This required a special refrigerant, and for a year a lithium chloride brine at −60°F coursed through the stubborn Blairmore until finally its treacherous quicksands were one great frozen mass—a 3 million cubic-foot ice cube.

"Now the shaft sinkers went to work. Explosives could not be used to blast loose the frozen sand; the shock could break the freeze pipes or rupture the vertical cylinder of ice that had been so precariously formed. So every 5 feet, 11 4-ton segments of tubbing (cast-iron casing in curved segments) were lowered, one by one, and placed into position. Thick lead gaskets were installed between segments and the tubbing bolted together to form a water-tight barrier. Foot by foot the job proceeded—through the 200 feet of Blairmore, and for a total of 150 feet above and below it."

76 rings of tubbing (each 5 feet deep) were installed, almost 7 million pounds of iron held together by 17,000 giant bolts. To insure a water-tight lining, miners pounded a total of 45,000 wooden wedges into place at three selected spots between the shaft wall and special tubbing rings. The wedges ranged in size from big circus tent pegs to almost toothpicks. They formed a mass so dense that not even a steel pike could be driven into it.

IMC had successfully "buttoned up" the Blairmore, and proved that the potash could be mined. The rest is history. FC



WORLD POTASH SUPPLY
(Million Tonnes K_2O)

	1975/76	1978/79	1979/80	1985/86	1990/91	1980/91 Increase
East Europe	11.0	11.5	10.0	15.3	19.0	9.0
North America	7.1	8.5	9.4	13.3	15.6	6.2
West Europe	4.4	5.3	5.7	6.1	6.1	.4
Asia	.7	.7	.8	1.9	2.3	1.5
Africa	.2	—	—	—	—	—
Latin America	—	—	—	.3	.5	.5
World Total	23.4	26.0	25.9	36.9	43.5	17.6%

TOTAL WORLD DEMAND
(Million Tonnes K_2O)

	1978/79	1979/80	1980/81	1981/82	1985/86	1990/91
North America	6.7	6.8	7.2	7.4	8.4	9.7
West Europe	5.8	5.9	6.1	6.3	6.9	7.6
East Europe	9.4	8.8	10.2	10.8	11.9	15.1
Latin America	1.6	1.7	1.8	1.9	2.5	3.3
Asia	2.7	3.0	3.1	3.3	4.1	5.4
Africa	.4	.4	.5	.5	.6	.8
Oceania	.3	.3	.3	.3	.3	.4
Total Demand	26.9	26.9	29.2	30.5	34.7	42.3

Source: PCS

Stockert and Logsdail work out of the head office in Saskatoon. Both are veteran fertilizer men. Logsdail joined PCS in 1979 from Terra; Stockert came from CF Industries last year.

"About 55% of our sales are to the U.S., 5% in the Canadian market, and 40% goes into international markets through Canpotex," explains Rolf Holzkaemper. "Co-ops and national accounts make up about 65% of our North American sales.

"We've gained share of market more rapidly than expected," he adds, "particularly in 1979–80 when our total sales reached 4.6 million tons KCl. As a result we have speeded up some of our expansion plans.

Holzkaemper, called by one industry observer "the smartest marketer in the potash business," thinks the gains in market share have been hastened "by having professional people who acted in the market place in a responsible manner."

The field staff is a veteran one, with an average experience in the fertilizer market of 12 years. As Tom Tucker points out, "The confidence of people in our salesmen was really the turning point. They knew our men and they believed in them."

It didn't hurt that PCS was able to deliver product (it's an advantage when you can ship from five different production sites). "We were recognized as a very dependable shipper," Holzkaemper notes with considerable pride. "And we've invested considerable

CANADIAN PRODUCTION
(Million Tonnes K_2O)

Year	PCS	Private Producers	New Brunswick	Total Canada
1975/76	—	4.8	—	4.8
1979/80	2.6	4.5	—	7.1
1980/81	3.0	4.8	—	7.8
1981/82	3.3	4.9	—	8.2
1985/86	4.9	5.3	.9	11.1
1990/91	6.9	5.3	1.4	13.6

Source: PCS

capital in trying to develop the best delivery service possible."

Today PCS operates in excess of 1400 company-owned or leased railcars, according to Bud Foley, head of transport operations for PCS Sales. Last year the company initiated the first unit train to move direct from the mine to warehouses in the Midwest. (IMC operates unit trains from the U.S. border, but product is shipped from Esterhazy to the border by truck.)

Potash centers have been established at four locations: Danville, Seneca, and Springfield, IL, and Waterloo, IA. Trains are loaded at the mine and unloaded at the potash centers within 24 hours of arrival. "We have a 7- to 8-day cycle from minesite to potash center and return," Foley points out. "This compares with an average turnaround of 35 to 40 days for single car deliveries. It took less than 3 days for the first unit train to move from Rocanville to Waterloo."

Each potash center is equipped for fast loading of trucks "to minimize delays and provide the best possible service to customers." The centers vary from 40,000 to 60,000 tons in storage capacity.

David Dombowsky calls development of the transportation system one of the milestones in the corporation's short history. "We took over operations at several mines during a rough railcar shortage. Sometimes we could only get a couple of cars a week. Here we were, sitting on all that product and we couldn't get railcars. We went to work and with a very short lead time built up a fleet of our own cars, got some warehouses under lease, and then started the unit train.

"We don't spend as much time now on domestic transportation as we did in the early days," he adds with a satisfied grin.

Holzkaemper, considers the potash centers a viable solution to smoothing out shipping problems in areas of concentrated use. "It takes a sizable number of tons to make a center feasible," he explains.

"Pricing out of the centers is calculated to equate with single car shipment from the mines, and there is a trucking allowance. All product moves from the center by truck."

The concept of the potash centers took some selling, though. As Tucker explains, "A lot of the smaller dealers are not set up to take truck delivery. We had to persuade them that it could be done using a payloader. They're beginning to adapt and they're finding that they like the system. Many of them are starting to work out backhauls. A 50–60 mile trucking range from the center we've found is reasonable as far as our dealers are concerned."

PCS sees the concept of potash centers as a possible answer in areas where rail abandonment is disrupting normal movement by railcar. Another advantage is becoming evident in these days of high interest rates. "Dealers are holding back, waiting until closer to season before filling up. With the centers, we should be able to fill those later-than-usual orders without delay."

Holzkaemper looks for potash supply/demand to be in balance this spring, with some possible local shortages. But looking ahead a couple of years, he confidently predicts, "We'll be talking more about allocation than trying to force a sale." This despite the fact that all Saskatchewan producers are expanding or have announced expansion plans, plus two new mines are being built at New Brunswick by Potash Company of America and Denison/Potacan, which when completed, will add in excess of 2 million product tons.

In a talk at the ISMA Mid-Year Conference held in Tampa, FL in mid-November, Holzkaemper predicted that "Supply and demand will be very close throughout the period under review (1980–1990)."

Looking at world potash supply, he noted that "We envisage availability to grow from 25.9 million metric tons K_2O last year to 36.9 million metric tons in 1985/86 and to 43.5 million metric tons in 1990–91. The possibilities of minor delays in implementing the expansions always exist; we cannot envisage, however, major production anywhere beyond the levels projected. (See Table 1 on page 26).

"Demand totaled 26.9 million metric tons K_2O in 1978–79 and again in 1979–80. Based on the apparent strong

How PCS Was Organized

A provincial crown corporation, Potash Corporation of Saskatchewan was established in February 1975. Its two wholly-owned subsidiaries, Potash Corporation of Saskatchewan Mining Limited and Potash Corporation of Saskatchewan Sales Limited, were incorporated in October 1976 when PCS made its first acquisition. PCS Mining is now divided into five divisions:

Cory

Established in October 1976 with the acquisition of the Duval mine at a cost of $128.5 million. Rated capacity of 1.2 million tons KCl/year has been increased to 1.5 million tons by debottling. Cost: $7.8 million.

Rocanville

Established in April 1977 with the purchase of Hudson Bay Mining & Smelting mine at a cost of $144 million. Phase I expansion increased capacity from 1.2 million tons KCl to 1.4 million at a cost of $11.5 million. Phase II expansion now underway will raise capacity to 2.0 million tons. Cost: $73 million.

Lanigan

Established in November 1977 with purchase of Alwinsal Potash mine at a cost of $76.5 million (plus former owner's liability for reserve tax of $9 million). Expansion and refurbishing at cost of $40 million raised capacity to 1.5 million tons KCl. Phase II expansion now underway will increase capacity to 3.2 million tons KCl. Cost: $400 million.

Esterhazy

Established in February 1978 with purchase of potash assets of Amax Potash Ltd. for $85 million. Assets included a portion of International Minerals & Chemical's reserves (estimated to be equivalent to 90 million tons KCl) and a long-term service agreement with IMC for production and processing.

Allan

Established in April 1978 with purchase of 60% interest held by U.S. Borax and Swift at a cost of $85.8 million. (Texasgulf retains its 40% interest). Rated capacity is 1.5 million tons KCl/year.

movement of potash so far this season, and a recovery in Soviet potash production and consumption to previous levels, we project an increase of 8.4% in the current year and a further 4.5% increase in 1981–82. By 1985–86, our analysis projects world demand of 34.7 million metric tons, to grow to 42.3 million metric tons by 1990–91." (See Table 2 on page 26).

If Holzkaemper's projections are correct, supply will exceed demand at the end of this decade by a scant million metric tons.

Could PCS and other producers be overestimating the market, with the expansion programs turning into overexpansion? David Dombowsky doesn't believe so. "There is always a good and a bad scenario. We're trying to read the market as carefully as we can and avoid as many pitfalls as we can. We know that we're going to make mistakes because producers have always made mistakes in gauging the market, but I do think this: the 1980s are not the '70s. Inflation is rampant, capital formation is difficult. I don't think the '80s will be characterized so much by overproduction as by underproduction."

As the largest supplier of material to Canpotex (and likely to continue so for the future), PCS is looking far beyond the borders of North America. Holzkaemper and Steve Dechka, his special assistant in the area of international markets, will be visiting important potash customers throughout the world on a regular basis.

"We expect that 60% of our potash will be sold overseas through Canpotex by the mid-1980s," Holzkaemper explains. "We hope to expand our agronomy program to include other areas of the world in support of the research programs being conducted by International Potash Institute."

That's not to say that PCS will be ignoring the North American market. Holzkaemper and his associates look for North American demand to grow from 6.8 million metric tons K_2O last year to 9.7 million metric tons by 1990–91. In his talk at ISMA, Holzkaemper declared: "North America is, and will continue to be, a significant supplier of food and feed grains to the world. The market outlook is firm in the short term; as stated, I project a 6–7% growth this year, following two years of nearly even movement. The forecast for North American demand is, all in all, conservative and may well be exceeded."

Broaden into N & P?

Holzkaemper restricted his projections to potash, but there is no secret that PCS is anxious to broaden out into nitrogen or phosphate, or possibly both.

Last year PCS joined with Agrico Chemical on a feasibility study to determine the economic viability of establishing fertilizer manufacturing facilities in Saskatchewan, assessing "the potential markets, plant sizes, and investment costs for manufacturing nitrogen and phosphate-based products." As Dombowsky pointed out in announcing the study, "Should the feasibility study result in decisions leading to manufacturing facilities in Saskatchewan, the Corporation would be in an excellent position to ensure a long-term supply of fertilizers for Saskatchewan farmers."

In another study, PCS joined with Ocelot Industries, a Canadian-based oil and gas exploration company to jointly investigate the possibility of producing ammonia and nitrogen-based fertilizers in Saskatchewan. Capital costs, markets, raw materials requirements, and site location are among the issues that will be addressed.

No conclusions have been reached yet on either study, but odds are that PCS will be producing ammonia and mixed fertilizers with the companies involved in the study, some other partner, or on its own. A possible partnership of Agrico-PCS in developing Agrico's phosphate rock reserves in North Carolina is also being rumored around the industry.

Dombowsky will only admit that PCS "is studying reserves in a variety of places, including North Carolina. But there's absolutely no commitment . . . and that's not the *only* source."

Speaking from what he called "an admittedly biased position," Dombowsky discussed the stability of today's potash industry compared with the situation of just a half-dozen years ago. "A number of things have happened to bring stability to the market place in terms of prices and supply. First of all, no one judged that world supply/demand would come together as quickly as it did. The Chinese came on with some fairly large orders, a mine went down in the Congo, and we took the opportunity of long supply to shut down one of our operations to refurbish it. The combined effect of these things heightened the demand.

"I would like to add this comment," he continues. "From the time we bought our first mine we had expansion in mind. And you'll note that we started expanding production capability immediately. This was a pretty courageous position on the part of our board because prices were low, cash flow was minimal, and we were already spending capital for additional acquisitions. As it turns out this was fortunate for the entire industry. No one else was investing money in Saskatchewan potash at that time; now all of us are pumping up production as quickly as we can. Without that headstart from PCS on expansion, shortages could be serious." FC